

NO EXERCISE-INDUCED INCREASE IN SERUM BDNF AFTER CYCLING NEAR A MAJOR TRAFFIC ROAD

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Background and Aims: Commuting by bike has a clear health enhancing effect. Moreover, regular exercise is known to improve brain plasticity, which results in enhanced cognition and memory performance. Animal research has clearly shown that exercise upregulates Brain-Derived Neurotrophic Factor (BDNF – a neurotrophine) enhancing brain plasticity. Studies in humans found an increase in serum BDNF concentration in response to an acute bout of exercise. Emerging evidence suggests that exposure to air pollution is increased during commuting. Furthermore, enhanced exposure to particulate matter (PM) air pollution is linked to negative neurological effects, such as neuroinflammation and cognitive decline. We carried-out a cross-over experiment to examine the acute effect of exercise on serum BDNF and the potential effect-modification by exposure to traffic-related air pollution.

Methods: 38 non-asthmatic volunteers (mean age: 43, 26% women) performed two cycling trials, one near a major traffic road (mean UFP concentration: 28867 particles/cm³) and one in an air-filtered room (mean UFP concentration: 496 particles/cm³). The heart rate during cycling and cycling duration were similar for both trials. Serum BDNF concentrations were measured before and 30 minutes after each cycling trial.

Results: As expected, exercise significantly increased serum BDNF concentration after cycling in the air-filtered room (+14.4%; $p=0.02$). In contrast, serum BDNF concentration did not increase after cycling near the major traffic road (+0.5%; $p=0.94$).

Conclusions: Although active commuting is considered to be beneficial for health, this health enhancing effect could be negatively influenced by exercising in an environment with high concentrations of PM. Whether this effect is also present with chronic exercise and chronic exposure must be further elucidated.